Technical Note

East Texas Plant Materials Center
Plant Materials Program – Texas May 2006

Nitrogen Use 'Medina' eastern gamagrass

Background

Eastern gamagrass [Tripsacum dactyloides (L.) L.] is a warm season native perennial with the potential for livestock forage in the southeastern United States (Dewald et al. 1991). From 1992 to 1994, the USDA-NRCS East Texas Plant Materials Center and Stephen F. Austin State University Agriculture Department conducted a three year study to evaluate management practices for sustainable production of eastern gamagrass selections in eastern Texas and western Louisiana. 'Medina' was one of the study selections. Clipping frequencies of 30, 45, and 60 days and actual nitrogen (N) fertilization rates of 0, 125, 250, and 500 lb / acre were compared on an Attoyac fine sandy loam.

The purpose of this technical note is to provide information about N use efficiency values for 'Medina' eastern gamagrass as affected by N rate and 45 and 60 day clipping frequencies.

Nitrogen Removal

Nitrogen removal was calculated using the harvested aboveground biomass. Nitrogen removal did not significantly differ between the 45 and 60 day clipping frequencies and continued in an upward pattern until the 500 lb N / acre application rate. (See Figure 1 at the end of this technical note.)

However, as N application rates increased within the clipping frequencies so did the amount of N removal by the plants. In both clipping frequencies, the 500 lb N / acre rate removed the highest amount of N. (See Tables 1 and 2.) Using higher N application rates gives the plant more potential N to utilize for dry matter production and growth. Nitrogen removal values varied yearly because of differing soil and weather conditions.

Nitrogen Fertilizer Recovery

Nitrogen fertilizer recovery is an estimate of the efficiency of the plant to take nitrogen from the soil and is expressed as a percentage. Recovery of N is dependent upon factors such as rate and time of application, N source, species, and moisture. Generally, N recovery for warm season grasses is highest at rates of 180 to 270 lb of N / acre. Beyond these amounts less nitrogen is used by the plant and more is lost through leaching and volatilization. (Bredja, 2000)

'Medina' was most efficient at the 250 lb N / acre rate for 45 and 60 day clipping frequencies. Tables 1 and 2 show the average recovery percentages for the 45 and 60 day clipping frequencies. Nitrogen recovery percentages varied more in the 60 day clipping frequency than the 45 day clipping frequency. (See Figure 2 at the end of this technical note.)

Yield Efficiency

Yield efficiency is defined as the average yield increase per unit of applied N. (Brock, 1984) Tables 1 and 2 show the three year average yield efficiency for the 45 and 60 day clipping frequencies and N rate / acre. Yield efficiency decreased as N application rates reached 500 lb N / acre. (See Figure 3 at the end of this technical note.) This decrease is a normal response of warm season grasses to high N rates. Fertilizer response varied on a yearly basis during the study.

Table 1. N use efficiency values for 'Medina' eastern gamagrass [Tripsacum dactyloides (L.) L.] as affected by N rate and a 45 day clipping frequency, USDA-NRCS East Texas Plant Materials Center, Nacogdoches, Texas 1992-1994.

N Rate	Dry Matter Yield	N [1/] Removal	N Content	N [2/] Recovery	Yield [3/] Efficiency
----------lb /acre----------			----------%----------		---lb DM yield/lb N---
0	9,115	114	1.25	----------	----------
125	12,539	173	1.38	42.8	27.4
250	15,797	238	1.51	48.1	26.7
500	17,402	285	1.64	48	16.6

1/ = N removal = (Dry Matter Yield) x (% N content) / 100

2/ = % N recovery = (N removal of fertilized plot) – (N removal of control plot) / N rate

3/ = Yield efficiency = [forage yield (fertilize) – forage yield (control)] / N fertilizer applied

Table 2. N use efficiency values for 'Medina' eastern gamagrass [Tripsacum dactyloides (L.) L.] as affected by N rate and 60 day clipping frequency, USDA-NRCS East Texas Plant Materials Center, Nacogdoches, Texas 1992-1994

N Rate	Dry Matter Yield	N [1/] Removal	N Content	N [2/] Recovery	Yield [3/] Efficiency
----------lb /acre----------			----------%----------		---lb DM yield / lb N---
0	9,214	94	1.02	----------	---------
125	12,863	144	1.12	39	29
250	20,084	247	1.23	59	43.4
500	20,432	270	1.32	45	22.4

1/ = N removal = (Dry Matter Yield) x (% N content) / 100

2/ = % N recovery = (N removal of fertilized plot) – (N removal of control plot) / N rate

3/ = Yield efficiency = [forage yield (fertilize) – forage yield (control)] / N fertilizer applied

Application

- Since 'Medina' eastern gamagrass removes N from the soil, this cultivar could be considered when addressing water quality concerns and phytoremediation of high levels of soil N. (NRCS Practice Standards Nutrient Management – 590 and Filter Strips – 393.)
- This information would be applicable when using 'Medina' eastern gamagrass for forage production. (NRCS Practice Standards Prescribed Grazing – 528 and Forage Harvest Management – 511.)

References:

Bredja, J.J. 2000. Native Warm Season Grasses: Research Trends and Issues. CSSA Special Publication No. 30.

Brakie, M. 1998. Yield and Quality of Eastern Gamagrass Selections as Affected by Clipping Interval and N Rates. Master's Thesis.

Brock, B.R. 1984. Efficient use of nitrogen in cropping systems. P.273-293. *In* R.D. Hauck (ed.) Nitrogen in Crop Production. ASA, CSSA, SSSA, Madison, WI.

Dewald, C., J. Henry, S. Bruckerhoff, J. Ritchie, D. Shepard, S. Dabney, J. Douglas, and D. Wolfe. 1996. Guidelines for the establishment of warm season grass hedge for erosion control. J. Soil and Water Conserv. 51 (1): 16-20.

Dewald, C.L. 1991. Eastern gamagrass Introductory Information. Southern Plains Range Research Station, USDA-ARS.

Douglas, J. 1993. Effects of Clipping Frequency and N Rate on Yield and Quality of Eastern gamagrass. Master's Thesis.

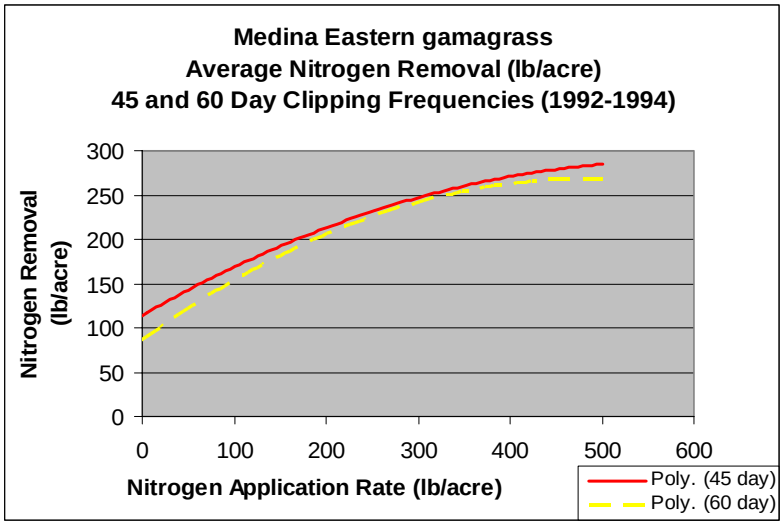

Figure 1 – Average Nitrogen Removal

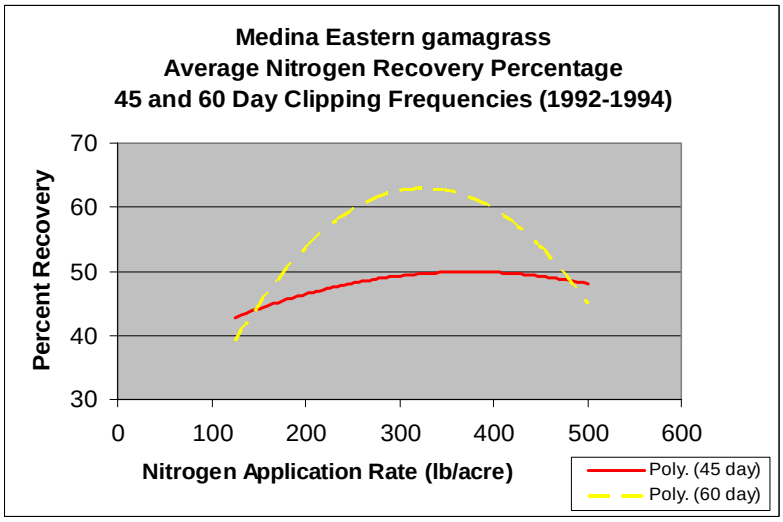

Figure 2 – Average Nitrogen Recovery Percentage

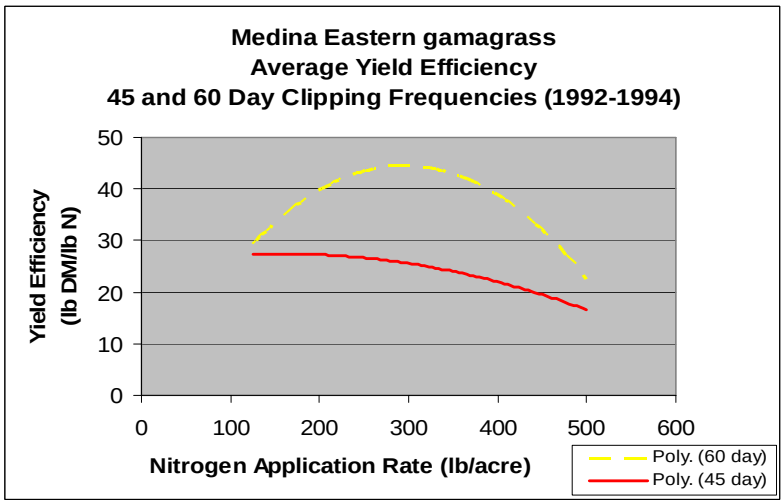

Figure 3 – Average Yield Efficiency